



INDIAN SCHOOL SOHAR
TERM II EXAMINATION (2018-2019)
PHYSICS – THEORY

No. of printed pages: 3

CLASS: XI
DATE: 15/11/2018

MAX. MARKS: 70
DURATION: 3Hrs

General Instructions:

1. All questions are compulsory. There are 27 questions in all.
2. Questions 1 to 5 carry one mark each, questions 6 to 12 carry two marks each, questions 13 to 24 carry three marks each, questions 25 to 27 carry five marks each.
3. There is no overall choice. However, internal choice has been provided in two questions of one mark, two questions of two marks, three questions of three marks and all three questions of five marks each.
4. You have to attempt only one of the given choices in such questions.
5. Use of calculator is not permitted

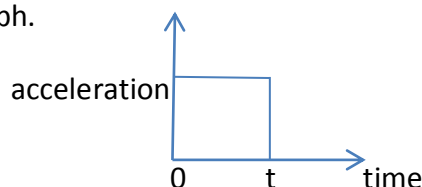
SECTION-A

1. Define the term percentage error and write down its expression. (1)
2. If both speed of a body and radius of the circular path are doubled, what will be the change in centripetal force ? why? Show using the formula. (OR)
2. Two satellites orbit the earth in circular orbits of radii $r/2$ and $3r$ respectively. What is the ratio of their orbital speed? (1)
3. Show graphically how 'g' varies as you move from the centre of earth to great heights above the surface of the earth. (1)
4. Define modulus of rigidity and write its expression. (OR)
4. Define compressibility. Write down its expression. (1)
5. A wire is stretched by a certain load. If the load and radius both are increased to four times, find the stress caused in the wire compared to the old stress. (1)

SECTION-B

6. Force (F) and density (d) are related as $F = \frac{\alpha}{\beta + \sqrt{d}}$. Find the dimensions of (i) α (ii) β (2)
7. Show addition of vectors obey the associative law with the help of diagram. (2)
8. Define work as a scalar product of two vectors. Mention the condition for the work done to be positive and negative. (OR)
8. What is a Geostationary satellite ? How does it work? (2)
9. Define kinetic friction. State the law of static friction. (2)
10. Name the different types of forces and their range. (2)

11. The acceleration time graph for a body is shown in the figure. Plot the corresponding velocity and time graph. Justify the graph. (2)



12. A police van moving on the highway with a speed of 30 km/h fires a bullet at a thief's car speeding away in the same direction with a speed of 192 km/h. If the muzzle speed of the bullet is 150 m/s, with what speed does the bullet hit the thief's car? (OR)

12. A cricketer can throw a ball to a maximum horizontal distance of 100 m. How much high above the ground can the cricketer throw the same ball? (2)

SECTION-C

13. If an object of mass " m " is placed at depth " d " below surface of the earth of mass M . Then derive an expression for the value of acceleration due to gravity of object at depth " d ". Consider the radius of earth to be " R ". (OR)

13. If an object of mass " m " is placed at height " h " above the surface of the earth of mass M . Then derive an expression for the value of acceleration due to gravity of object at height " h ". Consider the radius of earth to be " R ". (2)

14. Describe an experiment to determine the Young Modulus of the material of a wire with the help of diagram (OR)

14. Describe a venturimeter with the help of diagram. Hence derive an expression for the speed of fluid at wide neck of venturimeter. (3)

15. Derive an expression for the speed of efflux of fluid flowing out of an open tank with the help of diagram. (OR)

15. Derive an expression for the terminal velocity of raindrop in air. (3)

16. If a fluid flows through a cross-sectional area " A " with a velocity " v " then derive an expression for the relation between " A " and " v " with the help of diagram. (OR)

16. Derive an expression for excess pressure inside a liquid drop. . (3)

17. If a particle performing rotational motion has an angular momentum " L ", then show time rate of change of angular momentum of the particle is equal to the torque acting on it. (3)

18. State Newton's second law of motion. A machine gun has a mass of 20 kg. It fires 35 g bullets at the rate of 400 bullets per second with a speed of 400 m/s. What force must be applied to the gun to keep it in position? (3)

19. A satellite of mass ' m ' revolves around the earth of mass " M ". What should be the velocity of the satellite such that it revolves in an orbit around the earth. Obtain an expression. (3)

20. Define the work energy theorem for constant force. A body of mass 0.5 kg travels in a straight line with velocity $v = \alpha x^{\frac{3}{2}}$ where $\alpha = 5 \text{ m}^{-1/2} \text{ s}^{-1}$. What is the work done by the net force during its displacement from $x = 0$ to $x = 2\text{m}$? (3)
21. A steel wire of length 4.7m and cross-sectional area $3.0 \times 10^{-5} \text{ m}^2$ stretches by the same amount as a copper wire of length 3.5 m and cross-sectional area of $4.0 \times 10^{-5} \text{ m}^2$ under a given load. What is the ratio of the Young's modulus of steel to that of copper? (3)
22. Define angle of contact. The excess pressure inside a soap bubble is thrice the excess pressure inside another soap bubble. What is the ratio between the volume of the first and second bubble?(3)
23. Find the potential energy of a system of four particles of mass 'm' each placed at the vertices of a square of side 'a'. Also, obtain the potential at the centre of the square. (3)
24. A 400 kg satellite is in a circular orbit of radius $2R_E$ about the earth. How much energy is required to transfer it to a circular orbit of radius $4R_E$? Given radius of the earth = 6400 km. (3)

SECTION-D

- 25.(a) What is parallax. How can this method be used to find the distance between far away objects. Explain with the help of diagram.
- (b)The parallax of a heavenly body measured from two points diametrically opposite on the earth's equator is 60 second. If the radius of the earth is $6.4 \times 10^6 \text{ m}$, determine the distance of the heavenly body from the centre of earth. (OR)
- 25.(a) What are systematic errors. Mention the sources and causes of such errors. How can you minimize them.(b)The displacement of a particle at any instant is given by $t^2 = \sqrt{x} + 4$. Calculate (i)the velocity of the particle at $t=2\text{s}$ and $t=0\text{s}$. (ii) the acceleration at $t=1\text{s}$ and $t=2\text{s}$. (5)
- 26.(a) What should be the velocity of body such that it escape into space. Derive an expression.
- (b)What is the height at which the value of 'g' is the same as at a depth of $R/2$? (OR)
26. Explain the stress strain curve for a metal with the help of graph. (5)
- 27.(a) Explain types of strain. Mention the mathematical expression for each.
- (b) The average depth of Indian ocean is about 3000 m. Calculate the fractional compression $\Delta v / v$, of water at the bottom of the ocean. Given the bulk modulus of water is $2.2 \times 10^9 \text{ N/m}^2$. (OR)
- 27.(a) Derive Bernoulli's equation for the flow of a fluid in pipe of varying cross section with help of diagram.
- (b) What is the pressure on a swimmer 10 m below the surface of a lake. (5)